Site 174 Ebben Creek

Overview: The Ebben Creek Salt Marsh potential restoration site is located in southern Essex approximately 0.75 miles west of the Gloucester municipal boundary. The site encompasses approximately 22 ac of primarily salt marsh upstream of an existing culvert crossing under Route 133. Route 133 is shown on the 1893 USGS 15 Minute Series Salem, MA Quadrangle map, but was likely in place long before this date. The headwaters of Ebben Creek originate several miles upstream of the Route 133 crossing in western Gloucester. Ebben Creek joins the Essex River approximately 0.5 mi downstream of the crossing. Ebben Creek is conveyed under Route 133 via a 3 ft by 7 ft high granite block culvert. Two separate deployments of tide gauges during 2005 documented a maximum restriction of approximately 0.3 feet, but little restriction during more typical spring tide conditions. Other evidence suggesting the presence of a larger tidal restriction include: large scour pools both up and downstream of the crossing, bank erosion and limited populations of *Phragmites*. There is also a pronounced decrease in the typical dimensions of the creek upstream of Route 133. The approximate width of the channel is 18 and 35 ft upstream and downstream, respectively. The velocities created by this restriction in channel width account for the extensive scour to the marsh observed on both sides of the crossing. Only minor (less than 0.2 ft) subsidence of the high marsh plain was observed in comparison to the downstream marsh.

All of the restoration area is privately owned. The Route 133 right-of-way is under the control of MassHighway.

Structure conditions: Ebben Creek is conveyed under Route 133 via a 3 ft wide by 7 ft high granite block culvert. The granite blocks are supported by timber lagging and carry a concrete deck supporting the roadway. The upstream and downstream inverts and embankments are protected from scour by riprap. Beyond the riprap protection are significant scour pools. Inside the culvert there is some minor erosion around the timber lagging; however it is not severe enough to affect the structural integrity of the culvert. Overall the culvert is in fair condition and Route 133 is in good condition. The original age of the structure is unknown. The concrete deck was last replaced in 1934. Construction of a sewer line along Route 133 was recently completed and the roadway was repaved. There is approximately 4 ft of cover over the culvert which includes a number of underground utilites. The life expectancy of the culvert is estimated at 15 years. There are no known plans to replace the structure.

Ecological Integrity: The potential restoration site generally has a high level of ecological integrity. However, none of the restoration area is currently held in conservation status. The site is contained within the Parker River/Essex Bay ACEC and BioMap Core Habitat. Much of the supporting upland habitat is also included within the BioMap Core Habitat. Land uses are predominately undeveloped forest lands and agricultural fields with some residential development. The limits of the restoration area extend as far south as Grove Street. Several fingers of the wetland include small zones of emergent wetlands dominated by *Phragmites*. Other stands of *Phragmites* within the site are limited to small fringing populations associated with zones of groundwater breakout. The marsh also has a relatively high density of narrow lateral ditches which have reduced the number of salt pannes and increased the percentage of high marsh. Overall the ditches appear to be remaining open.

Aside from the high velocities, the crossing does not appear to restrict fish passage. The Essex River downstream of the site includes substantial soft shell clam beds.

There were two deployments of tide gauges at the Ebben Creek potential restoration site: the first from April 20 to May 2 and the second from August 11 to September 9, 2005. At each

deployment, two tide gauges were installed: one upstream and one downstream of the Route 133 crossing over the creek. Results of the April/May deployment show a small restriction at the crossing which becomes more pronounced at the higher tides above 6 ft adjusted to NGVD. There were eighth such occurrences out of 23 tidal cycles recorded during the deployment period. Tidal restrictions ranged from less than 0.1 to 0.3 ft and delays ranged from less than 10 to 47 min. The highest tide during the deployment period occurred on April 28 at 2:54 AM. The NVGD adjusted height downstream of the crossing was 7.40 ft. The upstream adjusted height was 7.10 ft and occurred at 3:31 AM. The restriction caused a tidal dampening of 0.30 ft upstream of the bridge and a delay of 37 minutes. The dampening amounted to less than 3% of the total tidal prism recorded at the downstream gauge. Longer delays of 47 min occurred on April 25 and 29 but with slightly smaller restrictions of 0.27 and 0.10 ft, respectively. Measured salinities were 0.9 ppt both up and downstream of the bridge during a slack tide condition.

Results of the August/September deployment show a similar restriction at the crossing which becomes more pronounced at the higher tides above 6 ft NGVD. There were 11 such occurrences out of 51 tidal cycles recorded during the deployment period. Tidal restrictions ranged from less than 0.1 to 0.35 ft and delays ranged from less than 10 to 33 min. The highest tide during the deployment period was on August 21 at 1:03 AM. The NVGD adjusted height of the water downstream of the bridge was 7.30 ft. The upstream adjusted height was 7.03 ft which occurred at 1:36 AM. The restriction caused a tidal dampening of 0.35 ft upstream of the bridge and a delay of 33 minutes. The dampening amounted to less than 3.9% of the total tidal prism recorded at the downstream gauge.

Biological benchmarks recorded only minor subsidence within high marsh zones in comparison to the unrestricted marsh (approximately elevation 4.7 ft verses 4.9 ft). This data supports the limited tidal restriction observed during spring tides.

Overall, the severity of the existing impairments is considered minimal. Replacement of the existing crossing with a much wider opening would reduce the high velocities and the extensive scour currently occurring at the Route 133 crossing. However, a reduction in the small dampening currently experienced during unusually high spring tide events is not likely to reduce existing stands of *Phragmites* upstream of the crossing. No loss of other fringing wetland communities including freshwater marsh/wet meadow and forested wetland are anticipated. No impacts to abutting developed lands are anticipated.

Socioeconomic: Recreational values of the potential restoration site are reduced by the lack of public access and protected lands. The proximity of the restaurant along Route 133 does increase the potential for public outreach. There are limited other educational opportunities with no known ongoing research or nearby schools. The site's Uniqueness/Heritage value is enhanced by its inclusion within the Parker River/Essex Bay ACEC. The potential restoration site does not include any known cultural resource elements or urban setting values.

Construction Logistics/Feasibility: There are a number of factors which increase the complexity of a culvert replacement at is site. The high traffic on Route 133, underground utilities including major gas sewer and water lines, overhead utilities, limited staging areas, and nearby businesses concerned with maintaining access during construction all contribute to the difficulty of this project. The size of the creek system will also require a large coffer dam for dewatering. Restoration at the site would require either a single span bridge or series of box culverts depending on hydraulic requirements. Construction will have to be phased to allow one-way traffic to be maintained. The total construction cost estimate for this potential restoration site is estimated to be $900,000. There are no known planning efforts to replace the existing structure.

Restoration Potential: The site is considered to have low restoration potential based primarily on the relatively high construction costs, the generally low level of current ecological impairments, and the lack of important socioeconomic benefits. Replacement of the culvert would have many complicating factors and require close coordination with MassHighway. The primarily benefit to be derived from the restoration effort would be a reduction in the amount of scour and bank erosion currently occurring along both sides of the crossing. However, the benefits derived from an enlarged structure at the Route 133 crossing do not appear to justify the expense. Further efforts should be limited to coordination with the Town and MassHighway to identify a likely point in time when the crossing will be scheduled for replacement due to structural considerations.

Site # 174 | Site Features | Scale: 1:1,200

Photo 1 - Downstream End of Roadway Crossing

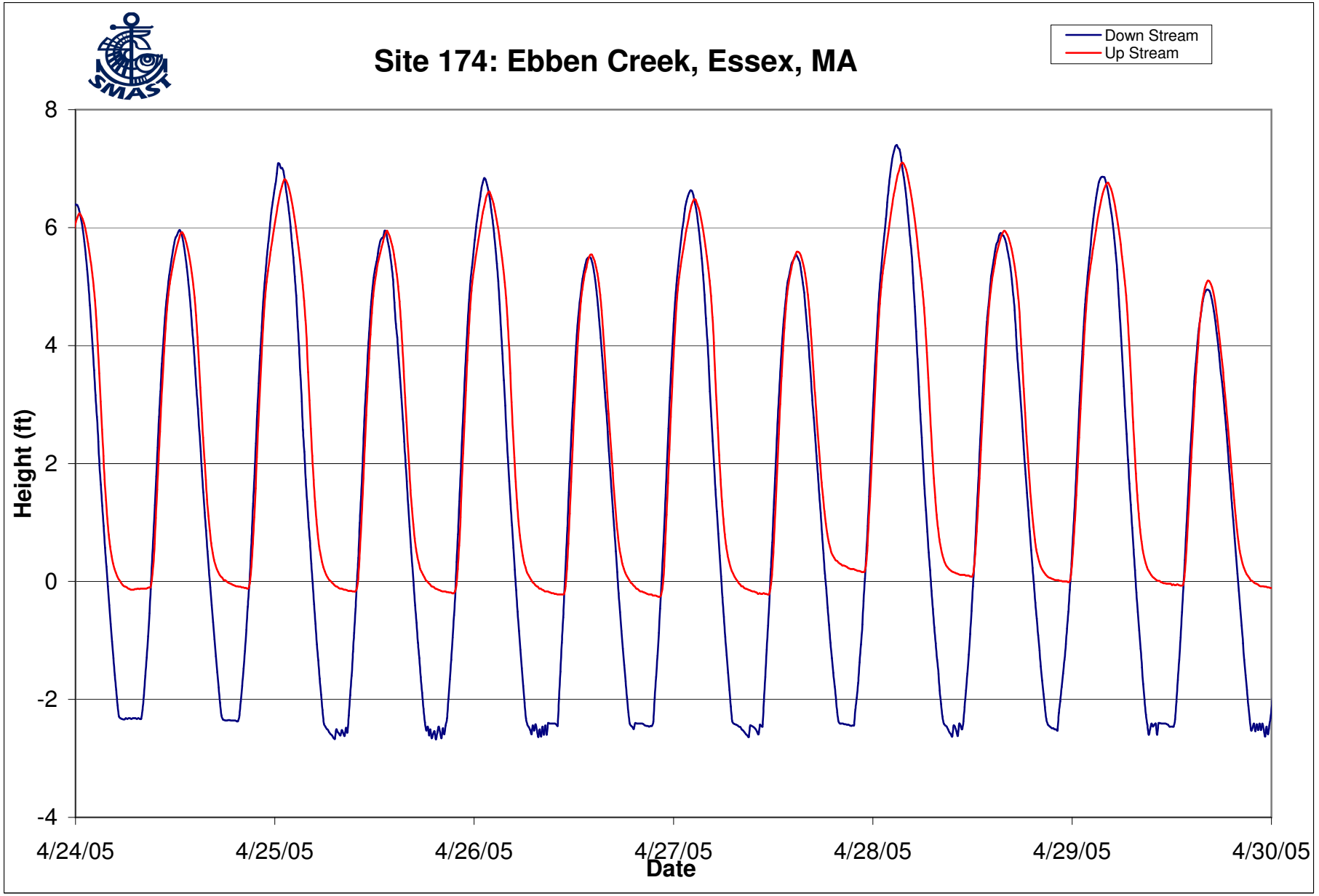
Photo 2 - Roadway Crossing Viewing West

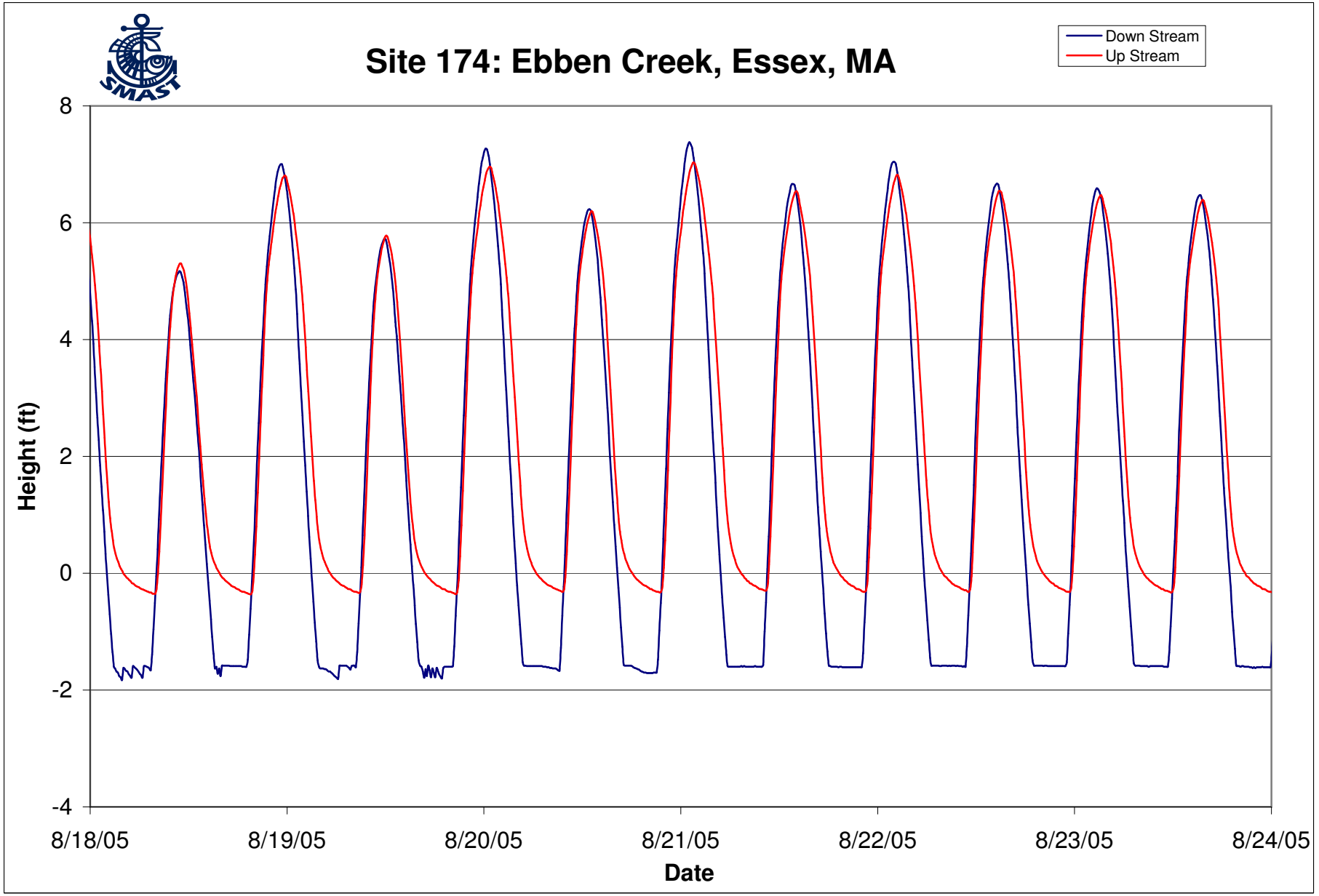
Photo 3 - Upstream End of Roadway Crossing

Photo 4 - Restoration Area Upstream of Crossing Viewing South

Photo 5 - Salt Marsh Downstream of Crossing

Photo 6 - Interior of Granite Culvert


Site 174: Ebben Creek, Essex, MA
Down Stream
Up Stream
Height (ft)
8
6
4
2
0
-2
-4
4/24/05
4/25/05
4/26/05
4/27/05
4/28/05
4/29/05
4/30/05
Date


Site 174: Ebben Creek, Essex, MA
Down Stream
Up Stream
Height (ft)
8
6
4
2
0
-2
-4
8/18/05
8/19/05
8/20/05
8/21/05
8/22/05
8/23/05
8/24/05
Date

Great Marsh Coastal Wetlands Restoration Planning
Rapid Field Assessment

Site # 174
Ebben Creek

Site Information

Site ID:	174
Site Name:	Ebben Creek
Municipality	Essex
Location:	South of Route 133, 0.75 mi west of Gloucester municipal boundary
Adjacent Waterbody:	Essex River

Affected Area (Acres)

Mudflat/Open Water:	0.8	Total Area:	20.7
Salt Marsh:	19.5		
Other Wetland:	0.1	*Other Description:*	
Other:	0.2	Fill	

Impairment(s)

Tidal Restriction	☑	Fill	☐
Obstructed Ditche(s)	☐	Invasive Species	☑
Impoundment	☐	Pollution / Siltation	☐

Severity of Impairments: Minimal

Project Type

Roadway Culvert(s)	☑	Obstructed Ditches	☐
Bridge	☐	Fill	☐
Berm	☐	Other	

Evidence of Restriction

Gauge Data	☑	Impounded Flow	☐
Downstream Scour Pool	☑	Obstructed Flow	☐
Upstream Scour Pool	☑	Invasive Species	☑
Bank Erosion	☑	Ponded Conditions	☐
Slumping	☐	Subsidence	☑

Structure / Channel:

Overall Condition:	Fair
Life Expectancy (Years):	15
Road Condition:	Good
Structure Type:	Stone box culvert
Structure Age (Years)	70
Structure 1 Width (Feet):	3
Structure 1 Length (Feet):	48
Structure 2 Width (Feet):	
Structure 2 Length (Feet):	
Skew (Degrees):	0
Cover (Feet):	5.5
Scour Protectection:	☑
Adequately Aligned:	☑
Headwall Type:	Cut Stone
Headwalll Condition:	Fair

Ecological Integrity / Habitat Value

Surrounding Land Use %

Commercial / Industrial	0
Residential	0
Agricultural	0
Undeveloped	0

Severity of Impairment(s)	Minimal
Invasive Plant Cover:	Low
Extent of Wooded Buffer:	Good
Habitat Connectivity:	Good
NHESP Estimated Habitats of Rare Wildlife:	☐
NHESP Priority Habitats of Rare Species:	☐
NHESP BioMap Core Habitat:	☑
NHESP BioMap Supporting Natural Landscape:	☐
ACEC:	☑
Anadromous Fish:	☐
Shellfishing Suitability:	☑
Barriers to Fish Passage	Minimal

Great Marsh Coastal Wetlands Restoration Planning
Rapid Field Assessment

Site # 174
Ebben Creek

Construction Logistics / Feasibility

Traffic Volume	High
Detour Potential	☐
Site Access	Good
Staging Areas	☑
Fill Material Concern	Minimal
Low Lying Property Concerns	Minimal
Overhead Utility Constraint	Severe

Underground Utilities

Water	☑	*Telephone*	☐
Gas	☑	*Sewer*	☑
Electric	☑	*Drainage*	☑

Permitting Complexity	High
Local Support	Unknown
Feasibility Cost	40,000
Design Cost	60,000
Permitting Cost	30,000
Construction Cost	900,000
Total Cost	1,030,000
Relative Cost/Acre	50,000

Socioeconomic

Recreation

Public Access:	☐
Watercraft / Portage:	☐
Wildlife Viewing:	☑

Education

Schools Nearby:	☐
Ongoing Research:	☐
Education / Outreach Potential:	Medium
Saftey Concerns (Access):	Medium

Uniqueness / Heritage Value

Rare Species Habitat:	☐
ACEC:	☑
Cultural Resource Features	☐
Urban Viewscape Value:	None
Urban Habitat Value:	None

Tide Surveys

	Start:		*Finish:*
Dates of 1st Survey:	4/20/2005	-	5/2/2005
Date of Highest Tide:	4/28/2005		
Max Measured Tidal Dampening:	0.3		
Percent of Tidal Prism:	3		
Measured Delay:	37 min		

	Start:		*Finish:*
Dates of 2nd Survey:	8/11/2005	-	9/9/2005
Date of Highest Tide:	8/21/2005		
Max Measured Tidal Dampening:	0.35		
Percent of Tidal Prism:	4		
Measured Delay:	33 min		

Summary

Uniqueness / Heritage Value:	Medium	Ecological Integrity:	High
Recreational Value:	Low	Logistics / Feasibility:	Low
Educational Value:	Medium		

Restoration Potential: Low